इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 5863 (1985): Method for determination of malathion residues in food commodities [FAD 1: Pesticides and Pesticides Residue Analysis]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 5863 - 1985

REAFFIRMED

[illegible]

Indian Standard

METHODS FOR DETERMINATION OF MALATHION RESIDUES IN FOOD COMMODITIES

(First Revision)

UDC 664 : 543 : 632·95·028 MALATHION

© *Copyright* 1986

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3

March 1986

IS : 5863 - 1985

Indian Standard

METHODS FOR DETERMINATION OF MALATHION RESIDUES IN FOOD COMMODITIES

(*First Revision*)

Pesticides Residue Analysis Sectional Committee, AFDC 56

Chairman
Dr H. L. Bami
Bangalow No. A, Malkaganj, Delhi

Members	*Representing*
Shri E. A. Almeida	Hindustan Ciba-Geigy Ltd, Bombay
Shri F. Quadros (*Alternate*)	
Shri S. K. Anand	Public Analyst, Government of Haryana, Chandigarh
Deputy Public Analyst (*Alternate*)	
Dr M. D. Awasthi	Indian Institute of Horticultural Research (ICAR), Bangalore
Shri K. D. Amre	National Organic Chemical Industries Ltd, Bombay
Dr J. C. Verma (*Alternate*)	
Dr K. C. Guha	Central Food Laboratory, Calcutta; *and* Central Committee for Food Standards, New Delhi
Shri P. K. Dhingra (*Alternate*)	
Dr R. C. Gupta	Directorate of Plant Protection, Quarantine & Storage (Ministry of Agriculture & Rural Development), Faridabad
Dr (Shrimati) G. Mukherjee (*Alternate*)	
Dr S. S. Gupte	Bayer (India) Ltd, Thane
Dr P. V. Raikar (*Alternate*)	
Dr R. L. Kalra	Department of Entomology, Punjab Agricultural University, Ludhiana
Dr R. P. Chawla (*Alternate*)	
Dr Kalyan Singh	C. S. A. University of Agriculture & Technology, Kanpur
Dr K. Krishnamurthy	Department of Food (Ministry of Agriculture & Rural Development), New Delhi
Shri G. N. Bhardwaj (*Alternate*)	

(*Continued on page* 2)

© *Copyright* 1986
INDIAN STANDARDS INSTITUTION
This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(Continued from page 1)

Members	*Representing*
Dr S. Madhusoodanan	Fredrick Institute of Plant Protection & Toxicology, Padappai
Dr J. C. Majumdar	Pesticides Association of India, New Delhi
Dr V. Srinivasan (*Alternate*)	
Dr M. S. Mithyanatha	Rallis Agro-Chemical Research Station, Bangalore
Dr A. L. Mookerjee	Cyanamid India Ltd, Bombay
Dr S. K. Mukerjee	Indian Agricultural Research Institute (ICAR), New Delhi
Dr S. K. Handa (*Alternate*)	
Dr Nagabhushan Rao	Regional Research Laboratory (CSIR), Hyderabad
Shri R. Rajgopal	National Institute of Communicable Diseases, Delhi
Shri G. C. Joshi (*Alternate*)	
Dr M. S. Sastry	Indian Veterinary Research Institute (ICAR), Izatnagar
Dr T. K. Verma (*Alternate*)	
Dr T. D. Seth	Industrial Toxicology Research Centre (CSIR), Lucknow
Dr R. K. Sethi	Indofil Chemicals Ltd, Thane
Dr K. Sivasankaran	Union Carbide India Ltd, New Delhi
Dr S. Y. Pandey (*Alternate*)	
Dr K. Visheswariah	Central Food Technological Research Institute (CSIR), Mysore
Dr J. R. Rangaswamy (*Alternate*)	
Shri T. Purnanandam, Director (Agri & Food)	Director General, ISI (*Ex-officio Member*)

Secretary

Shri Lajinder Singh
Deputy Director (Agri & Food), ISI

AMENDMENT NO. 1 DECEMBER 1995
TO
IS 5863 : 1985 METHODS FOR DETERMINATION OF MALATHION RESIDUES IN FOOD COMMODITIES

(First Revision)

(Page 4, clause **2.1***)* — Substitute 'IS : 1070-1992*' *for* 'IS : 1070-1977*'.

(*Page* 4, *foot-note with '*' mark)* — Substitute 'Reagent grade water (*third revision*)' for the existing title.

(FAD34)

Reprography Unit, BIS, New Delhi, India

Indian Standard

METHODS FOR DETERMINATION OF MALATHION RESIDUES IN FOOD COMMODITIES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 24 June 1985, after the draft finalized by the Pesticides Residue Analysis Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Malathion formulations are used in agriculture and public health for the control of various insect pests and vectors of diseases. Frequent and increased use of these formulations often result in harmful effects due to toxic nature of residues. Careful assessment of residues is, therefore, an important step in safeguarding human health and in framing sound regulatory policy.

0.3 This standard was first published in 1970 as Part 1, covering only cereals and oilseeds. The present revision includes other food commodities also. Further more sensitive gas chromatographic method (GLC) has been included in this standard.

0.4 This standard will enable the health authorities and others to follow a uniform test procedure for the estimation of malathion residues in various foods.

0.5 In the preparation of this standard due consideration has been given to the limits of malathion residues which have been laid down under the provisions of *Prevention of Food Adulteration Aet, 1954* and the Rules framed thereunder and the specified test methods are sensitive to the prescribed levels of residues.

0.6 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

---

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes gas chromatographic (GLC) and spectrophotometric methods for the determination of malathion [S - (1, 2-dicarbethoxyethyl)-*O*, *O*-dimethyl dithiophosphate] residues in foods.

1.1.1 Spectrophotometric method may be adopted as a limit test for routine purposes and is generally applicable at a detection level of 0·2 μg/g (0·2 ppm), whereas gas chromatographic method shall be the referee method with a minimum detection limit of 0·05 μg/g (0·05 ppm).

1.1.2 Though no set procedure for thin layer chromatography (TLC) has been prescribed, any standardized thin layer chromatography procedure may be followed, if necessary, for the purpose of clean up, identification and confirmation of malathion residues.

2. QUALITY OF REAGENTS

2.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977*) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

3. SAMPLING

3.1 The representative samples for the purpose of determining malathion residues in foods shall be drawn in accordance with IS : 11380 (Part 1)-1985†.

4. EXTRACTION AND CLEAN UP

4.1 Apparatus

4.1.1 *Kuderna Danish Evaporator Concentrator*

4.1.2 *Waring Blender*

4.1.3 *Water-Bath*

4.2 Reagents

4.2.1 *Acetonitrile* — Glass redistilled.

4.2.2 *Chloroform* — Glass redistilled.

---

*Specification for water for general laboratory use (*second revision*).

†Methods of sampling for the determination of pesticide residues: Part 1 Agricultural and food commodities.

4.2.3 *Hexane* — Glass redistilled.

4.2.4 *Diatomaceous Earth* — Celite 545, acid washed.

4.2.5 *Precipitating Solution* — Dissolve 2·5 ml phosphoric acid and 1·25 g of ammonium chloride and dilute to 1 000 ml with distilled water.

4.3 Watery Fruits, Vegetables and Fresh Foliage — Weigh 50 g portion of the chopped representative sample and transfer to a waring blender with 100 ml chloroform and blend for 2 minutes at high speed. Filter the extract through glass wool plug held on a conical funnel. Re-extract the residues of the sample material with two 50 ml portions of chloroform by blending 2 minutes each and filter through the same glass wool plug. Concentrate the combined extract to 50 ml in Kuderna Danish concentrator after drying through anhydrous sodium sulphate. Concentrate just to dryness in a rotary evaporator for gas chromatographic analysis. For spectrophotometric analysis, concentrate the whole filterate to dryness.

4.4 Cereals, Oilseeds, and Nuts — Follow the same procedure as prescribed in **4.3**.

4.4.1 Dissolve the residue in 50 ml hexane, add 100 ml acetonitrile to the flask and transfer the mixture to a 500-ml separating funnel. Shake the funnel for one minute. Allow the phases to separate and draw off the acetonitrile (lower) layer into a 500-ml round bottomed flask. Extract the hexane layer with an additional 100 ml acetonitrile. Combine the acetonitrile phases and concentrate to dryness.

4.4.2 Add 25 ml acetone to the residue and swirl the flask moderately for approximately 5 minutes. The residue should no longer cling to the walls of the flask and should be completely suspended. Add 50 ml of precipitating solution to the flask and swirl for one minute to mix. Allow to stand for 30 minutes, mixing occasionally as above during this period.

4.4.3 Filter the slurry by suction through a 60-ml medium-porosity buchner funnel pre-coated with a 6 to 10 mm layer of celite. Rinse the flask with an additional 50 ml portion of precipitating solution and filter the rinsings through the celite pad.

4.4.4 Transfer the combined filterate and wash solution to a 250-ml separating funnel and add 50 ml chloroform. Shake for one minute.

4.4.5 Draw off the chloroform layer into a 250-ml pear-shaped flask and repeat the extraction of the aqueous acid phase twice more with 50 ml portions of chloroform, combining the chloroform layers in the same flask.

4.4.6 Evaporate the solution to dryness using a rotary film evaporator with a water bath set at 35°C. Do not allow the flask to remain on the evaporator after the solvent has evaporated.

5. SPECTROPHOTOMETRIC METHOD

5.1 Principle — Malathion residues are dissolved in carbon tetrachloride and decomposed by addition of ethanol and sodium hydroxide into sodium *O, O*-dimethyl dithiophosphate, sodium fumarate and ethanol. Sodium *O, O*-dimethyl dithiophosphate is then converted to cupric salt which is soluble in carbon tetrachloride with the formation of intense yellow colour. The intensity of the colour is proportional to the concentration of *O, O*-dimethyl dithiophosphoric acid and is measured spectrophotometrically at 418 nm.

5.2 Apparatus

5.2.1 *Spectrophotometer*

5.3 Reagents

5.3.1 *Malathion* — Analytical grade.

5.3.2 *Carbon Tetrachloride* — Analytical grade (*see* Note).

NOTE — This may contain phosgene or other decomposed products that seriously interfere in the method. Purification with ammonium or sodium hydroxide and then drying and distillation gives a satisfactory product. Carbon tetrachloride as purchased may be satisfactory, but should be checked by running a control test.

5.3.3 *Ethanol* — Containing not more than one percent of water.

5.3.4 *Carbon Disulphide Solution* — Dissolve one ml of analytical grade carbon disulphide in 200 ml of analytical grade carbon tetrachloride.

5.3.5 *Sodium Sulphate Solution* — 9 percent (*m/v*). Prepare from analytical reagent grade anhydrous sodium sulphate.

5.3.6 *Concentrated Hydrochloric Acid* — analytical reagent grade.

5.3.7 *Standard Hydrochloric Acid Solution* — 6 N.

5.3.8 *Ferric Chloride* ($FeCl_3.6H_2O$) *Solution* — 5 percent (*m/v*). Dissolve 5 g of analytical reagent grade ferric chloride in 100 ml of 1 N hydrochloric acid.

5.3.9 *Copper Sulphate Solution* — Dissolve 3·5 g of analytical reagent grade copper sulphate crystals ($CuSO_4 . 5 H_2O$) in 100 ml of distilled water.

5.3.10 *Standard Sodium Hydroxide Solution* — 6 N, aqueous.

5.3.11 *Phenolphthalein Indicator Solution* — One percent (*m/v*).

5.4 Procedure

5.4.1 Dissolve the residues (*see* **4.3** *or* **4.4**) into 100 ml carbon tetrachloride and transfer to 250-ml separating funnel. Add 1·0 ml of the carbon disulphide solution and 25 ml of ethanol, and mix by gentle swirling.

5.4.2 Add 75 ml of sodium sulphate solution acidified with 2·5 ml of hydrochloric acid, and shake vigorously for one minute. Filter the carbon tetrachloride layer through a fluted, fast filter-paper into a dry 250-ml separating funnel. Do not allow any of the aqueous layer to run on to the filter-paper, and do not wash the paper.

5.4.3 Add 25 ml of ethanol to the filtered carbon tetrachloride solution, then add 1·0 ml of the standard sodium hydroxide solution and shake for exactly one minute (*see* Note). Carry out the procedure from this point onwards without interruption, as aqueous alkaline and acid solutions of dimethyl phosphorodithioic acid are stable for short periods only. Add immediately 75 ml of sodium sulphate solution, and shake vigorously for one minute. Allow the layers to separate, and discard the carbon tetrachloride layer. Add 25 ml of carbon tetrachloride, shake vigorously for 30 seconds, and discard the carbon tetrachloride layer. Add to the contents of the separating funnel 25 ml of carbon tetrachloride, two drops of phenolphthalein indicator solution and the standard hydrochloric acid solution, dropwise, with swirling until the pink colour disappears. Add 1·0 ml of the ferric chloride solution.

NOTE — Reaction periods of less than 30 seconds and more than 2 minutes produce low results.

5.4.4 Shake vigorously for 30 seconds, and discard the carbon tetrachloride layer. Repeat the extraction twice more with 25 ml portions of carbon tetrachloride and discard each portion. Add by pipette 15·0 ml of carbon tetrachloride and 1·0 ml of copper sulphate solution, shake vigorously for one minute, and allow the layers to separate. Run the carbon tetrachloride layer into a small beaker containing about 2 g of anhydrous sodium sulphate. Swirl the beaker for a few seconds, and pour off the carbon tetrachloride solution into a 4-cm absorptiometer cell (*see* Note). Measure the optical density of the solution, within 5 minutes of extraction to avoid fading, at 418 nm.

NOTE — The capacity of the 4-cm cells varies depending on the instrument and a different volume of carbon tetrachloride may be required in the final extraction. The sensitivity of the method and the slope of the curve will then vary accordingly.

5.5 Preparation of Calibration Curve for Malathion

5.5.1 Dissolve approximately 62·5 mg (weighed to 0·1 mg accurately) analytical grade malathion in ethyl alcohol and dilute volumetrically to 250 ml with ethyl alcohol. Mix well, then transfer 10 ml aliquot to another 250-ml volumetric flask and dilute to volume with ethyl alcohol (1 ml = 10 microgram of malathion). Using this standard solution, carry aliquots of 0, 5, 10, 15, 20 and 25 ml in order to cover the range of 50 to 250 μg of malathion through the procedure given in **5.5.2** to **5.5.3**.

5.5.2 Transfer aliquot to 250-ml separating funnel containing 100 ml carbon tetrachloride and one ml carbon disulphide solution. Add 25 ml ethanol. Then mix by gentle swirling. Proceed as per the details given in **5.4.2** to **5.4.4**.

5.5.3 Prepare calibration curve by plotting absorbance against microgram of malathion taken.

NOTE — It should be noted that there are two critical stages in the method. The first during the hydrolysis with the standard sodium hydroxide solution and the second when the copper sulphate is added. Precise timing and the discarding of 'cuffs' between layers helps in obtaining good results. Sodium sulphate may also crystallize out, but this may be overcome by placing the reagent vessels in warm water and gently swirling until the crystls are dissolved. Emulsions may occasionally be encountered, particularly when working temperature exceed 25°C or undue grinding and crushing are used before extraction.

5.6 Reporting of Malathion Residue — From the calibration curve, read the amount of malathion corresponding to absorbance observed and calculate and report malathion residues in terms of μg/g (ppm).

6. GAS CHROMATOGRAPHIC (GLC) METHOD

6.1 Principle — Residues of malathion are extracted from the prepared sample with chloroform. After purification by appropriate clean up procedures measurement is accomplished by gas liquid chromatography with an instrument equipped with a selective phosphorus — sensitive detector.

6.2 Apparatus

6.2.1 *Gas Chromotograph* — An instrument suitable for use with glass columns and equipped with an on-column injection system. A flame photometric detector equipped with a 526 nm phosphorus filter or an alkali flame 10 m cation detector may be used.

6.2.2 *Gas Chromatographic Column* — 60 cm borosilicate glass tube (4 mm ID/OD 6 mm) bent to fit the chromatograph and packed with one percent Reoplex 400 on gas chrom Q 60 to 80 mesh.

6.2.3 *Microlitre Syringes* — 10 µl and 50 µl-capacity.

6.2.4 *Plainmeter*

6.3 Reagent

6.3.1 *Malathion Reference Standard* — Analytical grade and of known purity.

6.3.2 *GLC Stationary Liquid Phase* — Reoplex 400 polyester.

6.3.3 *GLC Solid Support* — Gas chrome Q, 60 to 80 mesh.

6.3.4 *Solvents Specially Purified for GLC* — Nano grade quality (acetonitrile, chloroform and hexane).

6.4 Preparation of Standard Solution

6.4.1 *Stock Standard Solutions* — These solutions are stable for 4 weeks if they are kept tightly sealed and under refrigeration. Allow the solution to warm to room temperature before use.

6.4.2 Weigh accurately 50·0 ± 0·5 mg of the malathion standard; weigh directly into preweighed 50 ml volumetric flask. Dilute to the mark with acetone and mix well. Designate this solution, which contains approximately 1 000 µg/ml of the standard compound, as solution A.

6.4.3 Transfer by pipette 5 ml portion of *solution A* to a 100 ml volumetric flask and dilute to the mark with acetone. Designate this solution which contains approximately 50 µg/ml of the standard compound as gas chromatography standard *solution A* (*GC-A*). Transfer by pipette a 2 ml portion of solution *GC-A* to a 100 ml volumetric flask and dilute to the mark with acetone. Designate this solution which contains approximately 1 µg/ml of the standard compound as solution *GC-B*. These solutions should be prepared fresh daily.

6.5 Preparation and Conditioning of the Gas Chromatography Column

6.5.1 Weigh 0·25 g Reoplex 400 polyester in a small beaker and quantitatively transfer to a 500-ml round bottomed evaporation flask with chloroform. Add sufficient additional solvent to make about 300 ml and mix well by swirling. Weigh 24·75 g of the gas chrom Q solid support and add to the flask. Mix well by swirling and remove the solvent by evaporation on a rotary evaporator until a dry, flowing powder remains. Remove the remaining solvent by heating in an open evaporating dish at above 100°C until the solvent odour is no longer detectable.

6.5.2 For packing the gas chromatographic column, attach a 7·5 cm plastic funnel to the exit end of the pre-bent glass tube. While vibrating the tube with an electric vibrator or by rapid hand tapping, add the prepared packing in small quantities until the exit leg of the tube is filled.

6.5.2.1 Move the funnel to the entrance end of the tube. Insert a lightly compressed 1·5 cm pledget of silane-treated glass wool in the exit end of the tube and attach a source of moderate vaccum to the exit end.

6.5.2.2 Continue to add, packing slowly with vibration until the tube is filled to about 6 cm from the entrance end. Insert a 6 cm pledget of silane-treated glass wool in the entrance end. Compress the glass wool only enough to hold the packing in place.

6.5.3 Condition the column for at least 2 hours at a temperature approximately 25°C higher than the specified oven temperature. This step should be conducted with the exit end of the column unconnected to the detector but with a carrier gas flowing at the recommended rate.

6.5.4 Connect the exit end of the column to the detector and set the controls to provide the following suggested conditions. The parameters may be varied as per available facilities provided standardization is done.

Column oven temperature	165°C
Injection port temperature	180°C
Detector temperature	210°C
Flow rates	Iolar N_2 92 ml/min Hydrogen 29 ml/min Air 215 ml/min
Retention time	2·4 min

6.5.5 Repeatedly inject 2 μl portions of solutions *GC-A* and *GC-B* and a sample extract (*see* **8.1**) until the detector has been adjusted for optimum response and until good peak shape and constant chromatographic response to solution *GC-B* is attained.

6.6 LINEARITY CHECK

6.6.1 The gas chromatograph should be checked for linearity at least weekly and whenever the column, new or used, is newly installed in the instrument.

6.6.2 Find the proper combination of injection volume (between 1 and 5 μl), and attenuation setting to yield a peak height for solution *GC-B* of about 30 percent of full scale deflection.

6.6.3 Inject three or more portions of solution *GC-B* of different volumes (between 1 and 10 μl) selected to cover the range between 10 percent and 90 percent of full scale recorder deflection at the attenuation setting found in **6.6.2**.

6.6.4 Plot the responses observed, measured as peak areas, against quantity of standard injected to show linearity of response over the range covered by the attenuation setting chosen. Significant departure from linearity over this range indicates instrumental or operational difficulties which must be corrected before proceeding.

6.7 Procedure

6.7.1 Dissolve the residue from the last clean up step (*see* **4.3** or **4.4.6**) in exactly 1·0 ml acetone. Rotate the flask and swirl its contents carefully to be sure that all of the deposit on the walls of the flask is exposed to the solvent and that all soluble material has dissolved.

6.7.2 Find the proper combination of injection volume (between 1 and 5μl) and attenuation setting to yield a malathion peak height for solution *GC-B* of about 30 percent of full scale recorder deflection. The injection volume found should be used throughout the remaining steps.

6.7.3 For each sample solution, make a trial injection under exactly the conditions found in **6.7.2**. If the response is off scale, transfer by microlitre syringe, a 50 μl portion of the sample solution to a graduated centrifuge tube, keep the flask containing the remainder of the solution tightly stoppered through the rest of this step and next. Dilute to the 1 ml mark with acetone and mix well. Make a second trial injection of this diluted solution. If the response is still off scale, dilute to the 10 ml mark and make a third trial injection. Continue to dilute by factors of 10 until the response is on the scale.

6.7.4 From the dilutions made and the responses observed with the trial injections, estimate the total dilution factor required to match the response for the sample solution closely to that of solution *GC-B*.

6.7.5 To the flask containing the undiluted sample solution, add the volume of acetone required to provide the dilution factor in **6.7.3** (Ignore at this point the 50 ml portion removed for trial dilutions).

6.7.6 Inject, in sequence a portion of the standard solution, two portions of the sample solution, and a second portion of the standard solution.

6.7.7 Measure the areas of the corresponding peaks from the sample and standard solutions with a plainmeter.

6.8 Calculations

$$\text{Malathion residue, } \mu g/g = \frac{A_1 \times V_2 \times V_3 \times C}{A_2 \times V_1 \times M} \times f$$

where

A_1 = peak height/area of the sample;
V_2 = volume, in μl of standard malathion injected;
V_3 = total volume, in ml of the sample solution;
C = concentrate in $\mu g/g$ of standard malathion solution;
f = recovery factor = $\frac{100}{\text{percent mean recovery}}$;
A_2 = peak height/area of the malathion standard;
V_1 = volume, in μl of the sample injected; and
M = mass, in g of sample taken for test.

NOTE 1 — Percent mean recovery is determined by taking untreated control sample to which known amount of malathion is added and analysed as described above.

NOTE 2 — For each sample solution, average the two area measurements for the malathion peaks from the sample solution. Average the two corresponding peak area measurcments for the standard solution.

INDIAN STANDARDS INSTITUTION

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 331 01 31, 331 13 75 **Telegrams: Manaksanstha**
(Common to all Offices)

Regional Offices:	*Telephone*
*Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093	6 32 92 95
†Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054	36 24 99
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	2 18 43 3 16 41
Southern : C.I.T. Campus, MADRAS 600113	41 24 42 41 25 19 41 29 16

Branch Offices :

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001	2 63 48 2 63 49
'F' Block, Unity Bldg, Narasimharaja Square, BANGALORE 560002	22 48 05
Gangotri Complex (5th Floor), Bhadbhada Road, T. T. Nagar, BHOPAL 462003	6 67 16
Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002	5 36 27
5-8-56C L. N. Gupta Marg (Nampally Station Road), HYDERABAD 500001	22 10 10
R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71 6 98 32
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76 21 82 92
Patliputra Industrial Estate, PATNA 800013	6 23 05
Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001	52 27

Inspection Office (With Sale Point):

Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	5 24 35

---

*Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 — 89 65 28

†Sales Office in Calcutta is at 5 Chowringee Approach, P. O. Princep Street, Calcutta 700072 — 27 68 00

Printed at Arcee Press, New Delhi, India